

# SUPPLEMENT.

## The Mining Journal, RAILWAY AND COMMERCIAL GAZETTE:

FORMING A COMPLETE RECORD OF THE PROCEEDINGS OF ALL PUBLIC COMPANIES.

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### Original Correspondence.

#### PUDDLING BY MACHINERY.

For some years past Mr. William Menelaus, of Dowlais, has been working energetically to solve the difficult question of puddling iron by machinery, and, although he has not yet been completely successful in his efforts, he has done enough to convince most practical iron makers that the furnace he has been using is that which is destined hereafter to replace manual labour; yet, that the Dowlais Company are intent upon being amongst the pioneers of machine-puddling in Great Britain, and that they are ready to adopt any apparatus that will give the desired result, is evident from the fact of gentlemen closely connected with them having been sent out as special representatives of the Iron and Steel Institute to America, with an ample supply of various kinds of British pig-iron and ore, in order to ascertain accurately the merits of Dowlais's machine-puddler, to which numerous references have from time to time during the past three years been made in the *Mining Journal*. As the experiments in America have been under the control of Mr. G. J. Snelus (Associate of the Royal School of Mines, the chemist to the Dowlais Company, and the gentleman who rendered such valuable assistance in exposing the fallacy of the Sherman process), and Mr. John A. Jones, manager of works, assisted by Mr. John Lister, a practical puddler of considerable experience, no fear need be entertained as to the results obtained being thoroughly reliable; and if Messrs. Snelus, Jones, and Lister are as satisfied with the practical working of the invention as they have expressed themselves favourably impressed with the plan, it may be anticipated that the Dowlais's apparatus will speedily become much more favourably known in this country than it is at present.

The new puddling furnace, in its outward appearance, is described by the Cincinnati correspondent of the *Birmingham Post* as being like that used for hand puddling, only much larger. But its internal arrangements are very different in several particulars. It is formed of two open-ended cylinders, one of which is revolving by means of cog-wheels. It has two holes, one to admit the gases in combustion over the fire-bridge, and the other serves as a doorway for the reception of the charges of metal and their removal. By the steam-engine attached the cylinder can be made to revolve as fast as needed during the different stages of the operation. The furnace is furnished with a fan-blast under the grate, to urge the fire and produce gas. It has jets of fan-blast over the fire, injected for the purpose of ensuring a more perfect combustion of fuel. This blast is regulated by a valve, to give the workmen perfect control of the temperature suitable to the different stages of the puddling process. The air-hole has also a coil of wrought-iron water-pipe cast into it, to allow a stream of water to circulate round it and keep it cool, and the bridge-plate between the fire and the charge of metal has also a coil of water-pipe cast into it for the same purpose. Into the minute particulars of the building, casing, and setting of the furnace we need not go. When the furnace is charged with pig-metal, the melting down occupies from 30 to 35 minutes, during which a partial rotation is given to the furnace from time to time, in order to expose all sides of the charge to the flame. Machinery can work to almost any quantity, as the change may be as many tons as they by hand puddlers are hundreds. The hand puddlers' lump will now turn out about 3 ft. superficial of iron, whereas by machinery one can produce 30 ft. or more at one blast.

Assuming the anticipations of the inventor to be realised, and that a saving of 50 per cent. in labour and 33 per cent. both in coal and time is actually realised, the importance of the discovery to the iron-making interests of Great Britain can scarcely be estimated, more especially as it is claimed that by the new furnaces the qualities of ore usually treated in this country can be quite as satisfactorily treated as by the ordinary system of hand puddling. Thus it is stated that a bar  $\frac{1}{2}$  in. thick was made at Cincinnati from common Cleveland iron, yet it was bent over double when cold, without showing a crack or break. The cause of this is said to be that the ball is subjected to a more intense heat than usual, so that every part can be exposed to the fire much more thoroughly than it is possible to do by hand by the best workman; hence the impurities of the ore are dissipated, and the finished metal is left much more pure.

The very favourable telegram received from the Commissioners sent out to America was discussed at the recent meeting of ironmasters in Birmingham, and there appears to be great confidence in the process. The telegram states that by the process when tried with English pig and fettling the results were very successful, and that it is quite true that a greater quantity of puddled bar is brought out than there is pig charged, in most cases from 7 to 10 per cent. more. The furnaces in America are charged with 600 lbs. each heat, and eight heats can be worked in a day of 10 hours, when cold pig is put in; but if the molten iron be used 10 heats can easily be got. The Commissioners recommend that 10 cwt. per heat be charged, and as the charge by hand-puddling is only  $\frac{1}{2}$  cwt., while six heats can only be worked in about 12 hours, the superiority of the machine-puddler is very apparent. Of course, when the apparatus is adopted the machinery of the present forges will have to be remodelled, for the ordinary steam-hammers and rolls will be unable to grapple with such enormous weights; but as the inventor has wisely determined to accept a low royalty (2s. per ton), even the expense of making the change will be scarcely worth consideration. The process appears to have proved equally applicable to British and to American iron, and, therefore, it can be well understood why it is claimed to be one of the most important inventions introduced during the past half century.

**FOREIGN COPPER.**—With something like half of the Cornish copper mines abandoned, and the operations in many others curtailed within the last seven years, and the mineral reduced in round numbers from 140,000 tons to 70,000 tons within the ten years, it is interesting to see what our great foreign rivals have been sending to this country of late. The following figures for 1871 are based on the presumption that the concluding one-sixth of the year will closely resemble the lapsed five-sixths, and there does not seem to be any reason for expecting any material difference. In the first ten months of 1871 the quantity of ore was 35,539 tons, against 49,074 in the same period of 1870; regulus, 24,810, against 37,990; unwrought and part wrought, 26,347, against 21,059; the totals being 86,696 tons to the end of October last, against 108,123 tons in the corresponding period of 1870. Taking the whole year's estimate, we have

in 1871, calculating as above stated, 46,129 tons of ore, against 62,104 in 1870, and 72,199 in 1869; regulus, 28,945 tons in 1871, against 44,528 in 1870, and 38,769 in 1869; unwrought and part wrought, 30,738 tons this year, against 29,503 in 1870, and 31,460 in 1869. Thus it will be seen that the first ten months of this year are short of the imports of 1870 by no less than 21,427 tons. Presuming that the November and December months show no larger imports than their ten predecessors, we are less indebted to foreign mines than in 1870 by 30,323 tons, and than in 1869 by 36,616 tons, no small deficiency in the face of a sudden demand or a rising market. Up to a few days ago the demand for the lapsed portion of this year was not quite so good as that for 1870, though the contrast was not very disheartening. Our customers all over the world, exclusive of home consumers, had required 646,978 cwt. in 1871, as compared with 651,014 cwt. in 1870, a falling off of only 250 tons.

#### IRONWORKS AND COLLIERIES IN NORTH WALES. THE SANDYCROFT IRON AND ENGINE WORKS.

Of the ironworks in North Wales those belonging to the Sandycroft Company (Limited) are about the most extensive. They are pleasantly situated a little more than a mile from the Queen's Ferry Station of the London and North-Western Railway, and in a position so that vessels can come quite close to discharge or receive cargo. It was from here that the unfortunate Royal Charter was launched, and some forty miles from which she was wrecked on her return from Australia on the 26th of October, 1859, when she broke into three pieces, and went down with her treasure of upwards of 500 human lives. As might be expected, the works are of a very extensive character, containing a large quantity of machinery of almost every description, with large foundry, fitting and other shops, with corrugated iron roofs.

In the yard were several machines ready for shipping, pumps, barrels, boilers, &c. The foundry is about 120 feet long, and has six very powerful iron jib-crane, supported by wrought-iron box girders, with three heating furnaces. The pans hold from 2 to 4 tons of metal, and there is the usual gearing for tipping, with three stoves for drying the cores. Men were busily engaged in casting pump-lifts, and supports for washing machines, as well as general work of a varied character.

In the forge there is a 3-ton steam-hammer, Rigby's patent, made by Glen and Ross, of Glasgow, with a powerful steam-crane, capable of raising 25 tons, by Ormerod, of Manchester, and two puddling-furnaces. For the purpose of rivetting boilers there is an excellent machine, by Garforth, of Dukinfield, which acts admirably, and appears to do the work much more complete and uniform in appearance than could be done by hand, whilst the saving in labour, of course, is very great. The boiler to be operated on is suspended by a large crane from the top, and whilst in that position is brought into contact with the rivetter at the necessary point, when one blow sends the rivet home, and so the machine strikes rapidly until all is fully completed.

The boring-mill appears to be a very important place at the works, seeing that a large business is being done in pumps. It contains all the necessary machinery, including a moveable crane; and amongst the work in hand we noticed a cylinder in connection with an air-pump for the Van Mine, as well as others for various places. Near to the boring-mill is the turning-shop, with drilling, screw-cutting, and other machines, by Whitworth, of Manchester, Sharp and Roberts, and other well-known makers. There were also excellent shaping-machines, by Nasmyth, large planing machine, a slotting-machine, as well as others, together with portable steam crane.

The erecting-shop is a well-arranged building, and amongst the work going forward was a 20-inch cylinder horizontal engine, for the Roman Gravel lead mine, in Shropshire, a 32-inch cylinder for the Van Mine, and a 45-inch cylinder horizontal engine for the Northern Lead Mining Company, in the Isle of Man. There were also several other pieces of work, in various stages up to completion. In the shop there were cranes, and all the necessary machinery and tools required in the doing of a very extensive trade, and for which the Sandycroft establishment is in every way well adapted, having the advantage of railways to all parts of England and Wales close at hand, and being able to send direct from the premises by sea. A considerable business appears to be doing at the works in plates for boilers and other purposes. In the boiler-room there is a bending-machine for bending to any size or curve required, punching press and shears, two patent screwing-machines, by Whitworth, and a patent Schiele's fan.

In the pattern-shop there are the usual benches and requirements; whilst near to it there is a large room, with circular, and other saws worked by a horizontal engine, of 12-horse power, with a 12-inch cylinder. There is also a good deal of other machinery throughout the works, including a 30-horse high-pressure compressed engine, with 20-inch cylinder. A 14-horse, and a 12-horse, with a donkey-engine for the feed-water. The motive-power is supplied by several boilers, there being three tubular and two double-flued, made by the company, and a Cornish one, &c. Indeed, there appears nothing to be desired, so far as regards the machinery and appliances, for getting every description of work out of hand with rapidity, perfection, and economy. There are extensive pattern and store rooms, and an excellent suite of offices, some short distance from the works. Gas is made on the premises for lighting the workshops, offices, &c., which is a great advantage in a locality separated from any town, or even village. A good deal of the pig-iron used, we believe, comes from Glasgow by water, and whilst we were looking over the works we noticed a schooner come alongside to discharge a cargo of that material.

The machinery and material produced at the Sandycroft Works are of a varied character, but no small portion is for home and foreign lead, copper, and coal mines. Pump-trees appear to be largely turned out, and are tested by hydraulic pressure up to 200 lbs. to the square inch. Some of those pointed out, about to be shipped for the St. John del Rey Mining Company in South America, were tested to that extent so as to ensure their being thoroughly perfect before leaving the premises, and standing a very much greater strain than they are ever likely to be put to. There was also a novelty shown, in the shape of Collum's patent washing-machine for minerals, which had recently been brought out. The first one has just been completed, and others are being made, two being destined for

the Lisbon Mines, and one for the Monte Albo Lead and Silver Mining Company in Sardinia. The machine appears to combine several improvements important to those interested in the washing of ores. An extensive business also appears to be doing in roller-shells for crushing copper and other ores, and some of those being made are to be sent out to the Cape, and for the Spanish Lead Mining Company. Pump-clacks, and in fact everything relating to mining operations, are products which are apparently turned out daily at Sandycroft. In engines also the company appear to do a favourable business, having orders for the Isle of Man, and for some of the home mines. The extension of mining operations by English capitalists in South America and on the Continent, and the estimation in which mineral property in North Wales is now held, together with the many projects now being introduced, or about to be so, cannot do otherwise than keep those establishments engaged in the production of machinery suitable for mines, and their economical working, busy for a long time to come. We, therefore, look forward to a season not only of great activity but of great length to the ironworkers in North Wales engaged in those branches to which we have alluded.

#### COLLIERY ACCIDENTS, AND THE MINE INSPECTORS.

SIR,—By the fire at Messrs. Horton and Sons' Black Lake Colliery we have another added to the cases previously mentioned in the *Mining Journal* in which pits have had to be closed down, notwithstanding that unburied corpses of miners were within them.

There are such cases at this moment in the inspection districts of Lancashire, of Yorkshire, and now of South Staffordshire. Very different from either of the other two fires are the causes that brought it about, this last ignition has yet, like the rest, to be noted as one in which everything that could be has been done to afford the relatives of the deceased the little comfort that results from knowing that their dead have received Christian burial. In this, too, the local managers have the satisfaction of knowing that they had the assistance of a recognised independent official in the deliberations they took, and that they acted with his fullest concurrence, if not indeed upon his express recommendation, in the measures which after that deliberation they adopted. Nor should the working miner be other than thankful that the Legislature has placed in every colliery district an immediate representative of the Government and of the nation, to whom he may confidently look for such assistance as may not unfrequently prove very timely to him and his when terrible distress invades. Anyhow, his assurance must be enhanced, that even if it were possible for others to lack energy and humanity, on the part of the Government Inspector there will be no faltering. These conclusions are fairly drawn from the last accidents at Wigan and at Seaham Harbour, and they are confirmed by the action of the Inspector who is stationed in the district of which Messrs. Horton's colliery at Swan Village forms a part. Mr. Baker was amongst the first to descend the pit, and he was with the last who came up, when the smoke and vapours overpowered their lights, and the scaffolding of the shaft became a necessity.

Government Mines Inspectors, however, need no praise from those who know them, for so acting as to greatly encourage otherwise willing workers with the incitement that they "want not others to go where they will not lead." Still, I have felt it my duty to write as I do in relation to the conduct of those gentlemen when disasters arise, because it has been the fashion recently in some quarters to speak with insufficient respect the services they render the miner.

MINER.

#### COLLIERY EXPLOSIONS, AND THEIR PREVENTION.

SIR,—The plans of Mr. Joseph are certainly not deficient in breadth, and are very comprehensive. If when a colliery is projected the plans for laying out the concern and winning the coal were first submitted to a committee composed of the Government Inspectors and others, it is quite possible that the general plans formed might ensure greater safety; and, again, if the amount of coal to be worked by one pair of shafts were limited to 1000 acres, or any other quantity, this regulation might prove another source of safety.

Of course, this would bring the mines of England into a state as to supervision similar to those of the Continent, and grave objections would be raised against such a course: that is quite certain.

However, it must be borne in mind that the enemy of the miner must be grappled with and conquered, whatever the cost or difficulty may prove to be. The cost of an explosion, indeed, in money is always very serious, and the loss of life awful to contemplate.

Looking at the general proposition, that when a field of coal is to be worked pits are to be sunk near the extreme rise, and the coal worked out to the dip, it does not seem practicable in all cases. If we suppose that the dip is great the coal can certainly be conveyed to the dip much easier and cheaper than to the rise.

As to the working of the top seams first, that appears to be sound enough in theory, but will only be useful when the seams lie comparatively near together. The proposal to work the coal all away, and leave no barriers, would bring the system of extensive coal working back to what it was in ancient times. Instead of having properly divided districts, ventilated by separate currents of air, we would have a sort of chaos, without order or system, and in my opinion this would be highly dangerous.

Of course, in working to the dip engine power is used to bring the coal out on the main road; but when the dip is great then levels are driven out from this main road, and the coal is actually (that is the bulk of it) worked to the rise in these levels, even in dip workings. Still these workings are very far from being in the position that rise workings from the shaft are in, as in dip workings the several panels, or districts, can be readily drained, or, at all events, can be very much cleared.

But it is evident that rise workings in a fiery mine—that is, workings situated considerably to the rise of the shafts—are placed in a very awkward position for safe ventilation; and I would venture to suggest that in all cases where the rise is considerable an upcast shaft, placed at the extreme rise, would materially tend to safe and efficient ventilation, especially if a powerful fan were placed there.

It is quite obvious that a shaft placed at this point is not favourably situated for draining the mines of water and for drawing coals; a shaft, or pair of shafts, appear to be quite necessary about the centre of a large royalty for the purpose; and for working a very large royalty a pair of shafts placed at the centre, and one shaft



placed at the extreme rise, and a fourth at the extreme dip, would most probably prove the best arrangement, in a great majority of cases, both with regard to safety and economy.

It must not be supposed that additional shafts means additional expense, as a smaller number of shafts entails additional expense in making and in keeping long engine roads underground. If we suppose a pair of shafts were sunk in the centre of the coal field, and one at the extreme rise simultaneously, exploring drifts could be driven in both directions, in order to connect these shafts before any extensive workings were made to the rise.

I remarked above that the proposal to work the coal all away, without leaving any barriers over the whole of the field, would not be an improvement, but a retrograde step; the proper laying out of the field into suitable panels, or districts, is considered to be the most important matter connected with the working of a fiery colliery, as when this is attended to these districts can be properly ventilated by distinct currents of air, which is considered of the utmost importance in securing the safety of the mine.

Dec. 1.

#### COAL MINING IN BRAZIL.

SIR.—The Imperial Brazilian Collieries Company, a report of whose meeting was published in last week's Journal, has only been in existence four months, yet I was surprised to find that some of the shareholders were not satisfied with the progress made. In the first place, they must surely forget that the mines are a month's distance from London, and that coal mining in Brazil is not an established industry as it is in Durham, so that innumerable details have to be arranged which would be entirely unnecessary in a colliery district at home. The registration of the company would naturally take place before the prospectus was brought before the public, and it would certainly not be too much to allow a month for obtaining the necessary subscriptions from the public. Having ascertained that sufficient capital could be obtained for developing the mines, the next business would be to appoint a manager. Too great haste in this respect would be undesirable, for the maxim, "Marry in haste, and repent at leisure," might almost be altered to apply to the appointment of a man in whose hands the entire control of a company's property is to be placed. The directors of the Imperial Brazilian Collieries Company found and selected their manager, and he got together a staff of colliers to commence operations with, yet was enabled to announce his arrival in Brazil in about three months from the registration of the company. This should at once dispose of any complaints of delay.

As to the prospects of the company, they have never been questioned; and with the capital and skill that will, no doubt, be brought to bear upon the property the shareholders may reasonably anticipate a long-continued and highly profitable return for their outlay. The only real cause of complaint is that the whole of the capital was not subscribed as quickly as it should have been; but since enough has been obtained to permit of the works being properly started no fear need be entertained that the remaining shares will be placed before the capital they represent is required.

Dec. 7.

#### SILVER MINING IN NEVADA AND OTHER PACIFIC STATES.

SIR.—I was very much struck on reading the communication of "F. G. R." in the Supplement to the Journal of Sept. 30, and I am still perplexed in endeavouring to conjecture what it is that necessarily militates against the more general success of mining in the Pacific States, besides the high price of labour and general merchandise, a condition of things which "F. G. R." admits the probability of being overcome in time.

The question of profit and loss in mining, especially in the State of Nevada, has occupied a large share of my attention from the first time of my arrival here. To one whose whole life has been devoted to systematic practical mining it could not well be otherwise. It is not easy to resist the pungency of impressions received on witnessing the commencement and prosecution of mining wrong end foremost; and it is much to be regretted that some of our European practicals, on being transferred to this field of mining, espouse and continue some of the objectionable practices in operation here; one of which, and not the least injurious to mining, is that of employing miners by the day in the underground departments, instead of on contract. The reason alleged for such a course may appear plausible at first sight, but on investigation it will be found that it has nothing besides flimsy plausibility to support it. It is said that silver ores require so much care in assorting them at the time of their breaking, that the miners on contract would not be likely to give that attention to this part of their duties as is desirable. But be it so, what is more easily provided against than such a contingency? Let the men on contract work have nothing whatever to do with assorting the ores. It may be done in this way: Suppose there were (say) four stopes in any given level, let three of them be let on contract; of course, in the ordinary way of mining, they would not all be let at the same time. Let a contract to desue so much of the lode (the majority have to be worked in this way) be entered into, and when completed measured, and the men removed to the fourth, or vacant, stope to proceed in the same way as formerly; then let a sufficient number of men be employed to take down the lode, and assort the ores in the several stopes, on day work, allowing them something more than ordinary day's pay, in order that they may value their situation, and render service accordingly. Nothing, I think, can be easier of prosecution than this, nor more effectual in its working. Besides, the several pares of men would succeed each other in the different stopes, and take good care, I have not the least doubt, to leave no advantage to the others available to themselves, the tendency of which would be to keep alive the healthy spirit of emulation which, I need scarcely say, is that upon which the prestige of Cornish miners is based and depends.

Insurving the question of the comparative non-success of mining in Nevada, after a residence of upwards of six years in the State, I can only come to the conclusion that it is mainly, if not entirely, attributable to mismanagement. The mines are far richer than the generality of mines are, and the comparatively high price of labour and materials is fairly balanced by many advantages—such as no rental, no royalty, nothing to pay for land occupied or destroyed, and in most instances little or no water in the mines to contend with.

The reports of Messrs. Brown and Raymond being merely narrative and statistical, should be regarded only as representing what was and what had been, instead of what should have been, and in the future must be. Neither of those gentlemen, I apprehend, were able from personal practical knowledge to critically investigate and determine whether or not mining in the Pacific States had up to the period of their writing been prosecuted according to the rules of good mining elsewhere observed. I say it had not been, nor in any way approaching to it, save in the remotest analogy. There was the bare semblance, it is true, of mining, but that was all; and outside of that were the interminable and incalculably pernicious "rings" for market operations.

The practical miner's pedestal is experience, and thence his outlook. He surveys the situation in the light of its prospects, and does not allow himself to be unduly influenced by any historical or statistical narratives of what has been or is, but his genius is exercised in endeavouring to determine whether it is all it might have been, or may be made to be.

It may appear of great force to quote from such authorities as Messrs. Brown and Raymond that the expenses of working the mines on the Comstock vein have in the aggregate equalled the returns. But what, if true, would that evidence prove beyond mismanagement? To anyone acquainted with mining, and who has any knowledge of the situation and character of the Comstock vein, it would not be accepted as valid evidence of anything else besides its extraordinary richness; and on this latter quality, and its associate conditions, its value ought, in all fairness, to be estimated.

The extent to which this celebrated vein has been wrought is about 3½ miles, probably similar in extent lineally to the Devon Great Consols, in England. Suppose that celebrated mine had been owned and worked by forty-two different companies, and each freighted with heavy-salaried officers, about twice as many as were needed, and at the same time scarcely one of them acquainted with even a rudimentary knowledge of practical mining, what would the result

have been? I am not sure whether it is the more easy or difficult to conjecture, and yet, at all events, the lode would have been of the same intrinsic value it has been.

Having examined some of the mines on the Comstock vein, and been over the surface of most of them, I am fully convinced that, with ordinary prudent management, clear profits of from \$60,000,000 to \$75,000,000 could easily have been realised, all the disadvantages arising from the costly transportation of supplies of general merchandise at the early times included. Millions upon millions of dollars might have been easily extracted, without the aid of machinery, and without even employing a very large number of men, and, therefore, the necessary expenses of working these mines—or rather this vein—at the early times need not have been great, compared with what it has been.

The Reese River districts, with the City of Austin as their commercial centre, are next spoken of by "F. G. R." as signal instances of failure. To this I would reply—If the merits of a mining district are to be determined by the result of its working, irrespective of the mode of operations prosecuted thereon, then let Austin, and all its surrounding districts, be branded with the disagreeable epithet of "failure." But Austin, and other districts of Central and Eastern Nevada, need no more to have been failures than the Comstock itself had been, if their working had been in accord with the rules of even ordinarily good mining.

At the time of my first visit to Austin there were upwards of 3000 locations, or mining claims—mines so called—occupying an extent of ground but little if anything greater than a single mining sett in England; and yet these individual claims were dignified with the title of mines, and as such held in the determined grip of isolation, each intended for separate and distinct working. More than two-thirds of these so-called mines were on branches, many of which were only a few inches in width, and all of them merging at one point or another in the main or parent veins.

I have seen pompous mining establishments there in those days, with fast men and fast horses at the head thereof—the principal of the former in receipt of \$8000 per annum, and his subordinates proportionately remunerated, and at the same time employing seven or eight men only on a branch vein, as their best and only prospect, one inch in width of ore that would not pay for milling after their extraction. This was not a solitary case, hundreds of such were extant in those days. Is it much to be wondered at, then, the absence of more general success in mining; or is it proper that the value of a district should be estimated and determined from such a basis as this?

ROBERT KNAPP.

Elsworth, Nye County, Nevada, Nov. 8.

#### MINING IN COLORADO.

SIR.—I arrived here on the 10th inst., and have spent my time since my arrival in going through the mines; and I am glad to say that there is a progressive movement in some of them. At the Bobtail Mine they have commenced an adit level or tunnel in the foot of the mountain, that will come into the mine within a few feet of the bottom, and open up large quantities of ground that will pay well for the working, and enable them to resume the sinking of the main shaft to deeper levels. This is a step in the proper direction, and when completed will give employment to a large number of men, and cannot fail to yield large profits to the shareholders, the mine being very rich—some ore having this week been sold that brought over \$300 per ton, from ground that was thought worthless.

The Gunnell is also in full work, and is leased by five different companies. Since I left here lessees have been paying from 15 to 30 per cent. of the gross proceeds to the owners, and are doing well themselves, some of the ore running from 15 to 18 oz. of gold to the cord, or nearly 2 ozs. of gold to the ton. This mine, as I have before stated, was abandoned for poverty by its agents, and the men left unpaid. But now the men are working it, having to pay at the least 20 per cent. of all the gold to the companies, and are doing well themselves. This alone, Sir, will show what the management of the Colorado Mines has been; and that with proper management they will leave great profit to any company that invests in them.

I am glad to inform you and friends that the most important discovery of silver mines has lately been made in Park County, in this Territory; the Georgetown nor the Salt Lake district is not in any way to be compared to it. I have to-day seen several tons brought over here to the Boston and Colorado Smelting Works that was taken from the backs of the lodes, which assays from 600 to 700 ozs. per ton of silver. The lodes are large, varying in size from 6 ft. to 30 ft. in width, and are very speedy for working. I will write you more on this important discovery in a short time.

H. B. GROSS.

Central City, Colorado, Nov. 15.

#### MINING IN THE WHITE PINE DISTRICT, NEVADA.

SIR.—I have been reading over the Journal of Sept. 23, and see there some accounts of the White Pine and other mines in this western country, and by said accounts should think that they were very rich, if I had not worked in the different mines and seen for myself. And perhaps there are many people like myself, when reading the various reports on the Foreign Mines, and such glowing accounts, who are led to think they are good investments, and that the companies that have bought them have properties of immense wealth. But little they think how soon those lime rock deposits are excavated. For instance, at the Ward Beecher Mine, Treasure Hill, one of the largest bodies of ore yet found on the hill: 12 months ago there was not 20 fms. worked out in all the mine, but two months from now, if continued working as at present, there will not be 1 ton of quartz left in it; but it has been a rich chamber of ore, and has paid the English Company—the Eberhardt and Aurora Company—handsomely. But, then, as to the other claims owned by the same company; next to the Ward Beecher, in a southerly direction, is the Earl, a good deposit of ore, and will last for awhile longer than the claim mentioned before, but, like it, will soon get worked out. Joining the Earl is the North Aurora, not much worked on as yet, but to all appearances is the most permanent mine the company has, and looks as if it will be a good mine, when the two claims before mentioned will be numbered with the things that were. West of North Aurora is the Iceberg, a claim there was once rich where ore was taken out, but that is gone, and the lime rock is all that remains, and all the benefit it is to the company it will do to dump the waste dirt on taken out from the North Aurora, if ever it should have much poor dirt taken out. The next claim is on the south slope of Treasure Hill (the rest being on the western slope), called the Eberhardt, and is, it seems, in England considered to be of great importance, but I think it at least of questionable value; and, although the English people gave a good round sum of money for it, if to-day it were offered on Treasure Hill for sale for \$500, or half that money, would not find a purchaser; and the best ore they got from there was taken from the dumps that former companies threw away as waste dirt. But then you may ask if there is not any prospects of striking more deposits further down? It is possible, but prospects are so unfavourable that it would dishearten any experienced miner, or men who understand mining, to prospect further than what has been prospected.

I see in a report of a meeting of the Great Western Mining Company a discussion that ensued relative to the present depression in the market value of South Aurora shares. The South Aurora claim joins the North Aurora, and has been a good deposit. But little discussion would have taken place, I think, if the discussing party had known there is not a ton of ore in sight in the said mine to be taken out. I and other miners have to praise the company, or shareholders, for prospecting done there, as it gives employment to the working man, and there is more prospecting done in the South Aurora than any mine on the hill, and they still continue. Prospects for striking another deposit are the same they ever were, and if worked by the same force as it is worked with now, and prospected in the same manner, against this time next year it will be the same as it is now. Companies must recollect that those lime rock deposits are far different from fissure veins, and they ought not to go to too much expense, like that of the Eberhardt and Aurora Company, which company has put up a tramway to take rock from their mines to the mill, a distance of 2½ miles, and it has cost many thousands of dollars, but never will be a success, and will never pay for itself. And I am

not by myself in thinking the time is not far distant when there will not be a mine on Treasure Hill of any importance.

I see also the English company that bought the Mineral Hill Mine have given a considerable part of their large capital for the said mine. No one can say but they have a valuable property, but at present the mine is looking very poor, and unless there are new deposits struck they would sooner have had the former company keep it than to have bought it themselves. The fault is the merits of the mines are represented too high in England as a general thing, and there is too much money given for the plant. There is no one can say but that the mines and mining districts are great and profitable fields for English mining capitalists to invest their money in, but they should have men who understand the mines and the working of them advantageously to inspect and report to them before buying. The mines here are far different from those of Cornwall and many other places, and most companies make a great mistake when they send out a mining expert from the old country to report on the merits of the mine they are negotiating for, because in many cases they know no more about the mine than parties who have never seen a mine. Only experience can teach or make a man capable to report on the merits of this far western country, as the formations are so varied and different. Even when science tries to explain or account for them science becomes no science at all, and it is only those who believe facts as they appear can account for them.

My object in writing this letter will be accomplished if you publish it—that is, to let the readers of the Journal know a few facts about the White Pine Mines. Having worked there and at Mineral Hill, I have told the truth about them.

A WORKING MAN.

Mineral Hill, Elko County, Nevada, Nov. 2.

#### THE WIRE TRAMWAY AT THE EBERHARDT AND AURORA MINES, NEVADA.

SIR.—I notice in your report of the meeting of the Eberhardt and Aurora Mining Company that the Chairman made some observations respecting my recent inspection of the Wire Tramway at their mines, which are, to a certain extent, inaccurate, and which I beg you will allow me to correct. He is reported to have said—"Mr. Thairwall, the engineer employed by the patentees, said that, had he been there during its construction, he could not have made any very great improvements at much less cost;" and—"Mr. Thairwall's chief difficulty has been in getting the saddles to travel along the wire without coming into collision with the posts."

With respect to the first sentence, I would observe that I did report that the workmanship of the line was good and creditable, and that, on the whole, I was satisfied with the manner in which it had been carried out, there being but few modifications required in the work that had been done by the Eberhardt Company; but, being quite unacquainted with the cost of labour and material in Nevada, I did not make any statement with regard to the expenditure.

The statement contained in the second sentence quoted is quite an error. There never was such difficulty as the boxes striking against the posts; the box-heads slipped on the rope because inclines of 1 in 4 were attempted with saddles intended for moderate inclines, not exceeding 1 in 6, which was the maximum stated when the portion of the material brought from England was ordered.

Gresham-street, Old Jewry. WILLIAM THAIRWALL.

#### THE WIRE TRAMWAY AT THE EBERHARDT AND AURORA MINES, NEVADA.

SIR.—I observe that in your report of the proceedings of the recent meeting of the Eberhardt and Aurora Mining Company the directors state that the cost of constructing 2½ miles of wire tramway at their mines in Nevada has been 35,000£, and the Chairman further said that if they had come to me I would not have undertaken the work at a lower cost. Allow me most emphatically to contradict the latter statement, whilst I protest against the former as simply preposterous.

The cost of materials for that line (timber for 50 or 60 posts excepted) was 1550£. In England. The cost of constructing such a line on similar ground in any country in Europe—materials, timber, duty, and considerable land carriage included—would not have exceeded 3000£. The rates of labour, carriage duty, &c., affecting work in the Western States are now just as well known in this country as on the spot; and there is not the slightest doubt that double the European cost, or somewhere about 6000£, would have been a good contract price for the line, even under all the difficulties which were to be encountered, and which would have precluded the possibility of constructing a fixed railway. The directors entailed on themselves some extra expense, but nothing in comparison to the cost stated, by ordering their plant here before they made their survey. The line was described as straight, and with an even inclination of 1 in 6, and plant was sent accordingly. It subsequently transpired that five angles were necessary in the 2½ miles, and that there were inclines of 1 in 3 in both cases, necessitating alteration and expense, and till rectified irregularity in working.

The Chairman also stated that the boxes struck against the posts, a difficulty which had to be overcome. Now, this is simply an error; no such difficulty existed, and I cannot help thinking there are far more important errors in the matter of accounts. Is it not worth while for the Eberhardt and Aurora shareholders to enquire why, whilst cost for the materials here is only 1550£, and the line if constructed here would only have cost 3000£, it should cost them erected in Nevada 35,000£.

C. HODGSON.

Gresham street, Old Jewry, Dec. 7.

#### THE EBERHARDT AND AURORA MINING COMPANY.

SIR.—The estimated cost by this company for erecting at its mines a wire tramway has been considerably exceeded. This, with the accident to the engine-boiler of the International Mill, appears to have operated so strongly on the minds of the shareholders at the last meeting that they lost sight of the fact that there is nothing in the reports from the mines which shows any change in the future prospects of the company since the meeting in June last beyond, of course, this increased expenditure on capital account, which will amount to about 2½ per share on the number of shares already issued. It is easy to say now, by the light of past experience, that the working capital of the company was too small to cover possible accidents and possible contingencies; but was it so safe to say this when the company was formed? It should not be forgotten that the directors were anxious to keep the capital account as small as possible, and that if they had asked when the company was first formed for what they ask now it would have been given without a murmur. Such are the contradictions of human nature.

It does not appear, even if the responsibility of the erection of the tramway had originally been thrown on the maker, that he would have undertaken it at a much less sum than its present cost. Of what advantage will this tramway be to the company, and how will the advantage compare with the actual cost of the tramway? The cost of hauling by teams averages about 4¢ per ton. The cost of hauling by tramway will be about 8¢ per ton. Thus on 24,000 tons of ore, which is less than sufficient to keep the International Mill running for twelve months, a saving of 14,400£ per annum will be effected, or about 50 per cent. on the actual cost of the tramway. Another great advantage is that ore can be conveyed to the International Mill uninterruptedly all through the winter and summer at the same uniform cost.

With regard to the accident to the boiler, I think that a certain responsibility—it may be a moral responsibility only—rests with the makers. In such an important undertaking as this, and with their large experience, I think the makers ought to have ascertained the nature of the water to be used, and if it contained much lime, so as to have advised the superintendent of its pernicious quality, or made such provisions for counteracting its effect as would, doubtless, be known to them. It is possible that no importance attaches to what has been said on the thickness or thinness of the boiler-plates. It is as easy to make boiler-plates too thick as to make them too thin. The accident has more probably arisen from one of two causes—either absence of water, or the presence of lime in the water. We have the same difficulty in England, and similar accidents have occurred here. Water deposits lime at boiling heat, and as the pressure on the gauge is increased, so, in proportion, does this deposit harden, until it becomes similar to stone, and thus prevents the water from counteracting the effect of the fire on the boiler-plates, consequently the plates are wholly or partially burnt through. The remedies for this are not difficult to put into operation. The boiler should be frequently cleaned, and as much of the lime got rid of as is possible before the water is pumped into the boiler. The exhaust steam and the cold water should be passed through a condenser, by which means the latter can be brought to boiling heat, when a very large portion of the lime would be deposited in the condenser, which could be cleaned out with ease at any convenient time. By this means, also, hot water would be pumped into the boiler, and a great saving of fuel effected. I see no reason to apprehend a recurrence of the accident to the International Mill, if ordinary caution is exercised.

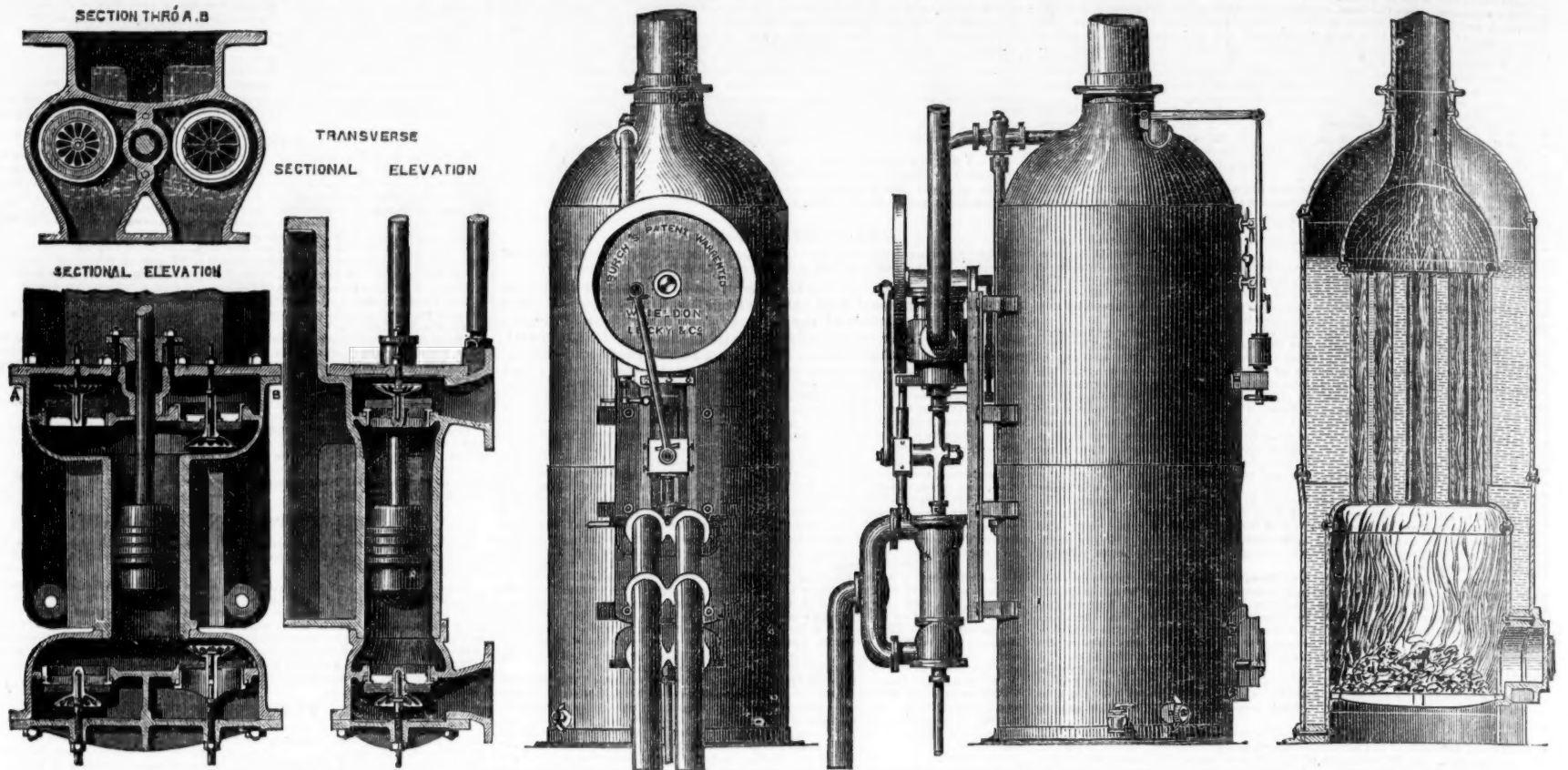
Now let us endeavour to see how the proposed purchase of the White Pine Waterworks is likely, if carried into effect, to operate on the future interests of the company. The purchase-money is fixed at 30,000£. Up to the present time the Eberhardt and Aurora Company has paid 5000£ per annum for water, or



in a shoot or slide into a ship or other receptacle.



## BURGH'S PATENT "WARRANTED" MINING STEAM-PUMP AND BOILER.



The illustration shows a modern arrangement of pumping-gear particularly suitable for mining purposes, because it is equally applicable to surface as for deep workings. The main features of the boiler are that it is cylindrical, vertical, and tubular, and that brick-work or setting is entirely ignored; therefore, economy is instituted at once—to say nothing of the advantage of the tubes over a large plain surface for the flame to act on, as in the case of the usual Cornish boiler.

The fittings are carefully arranged, so that the engineman has all of them under his command at the same time without running from place to place, as is too often requisite.

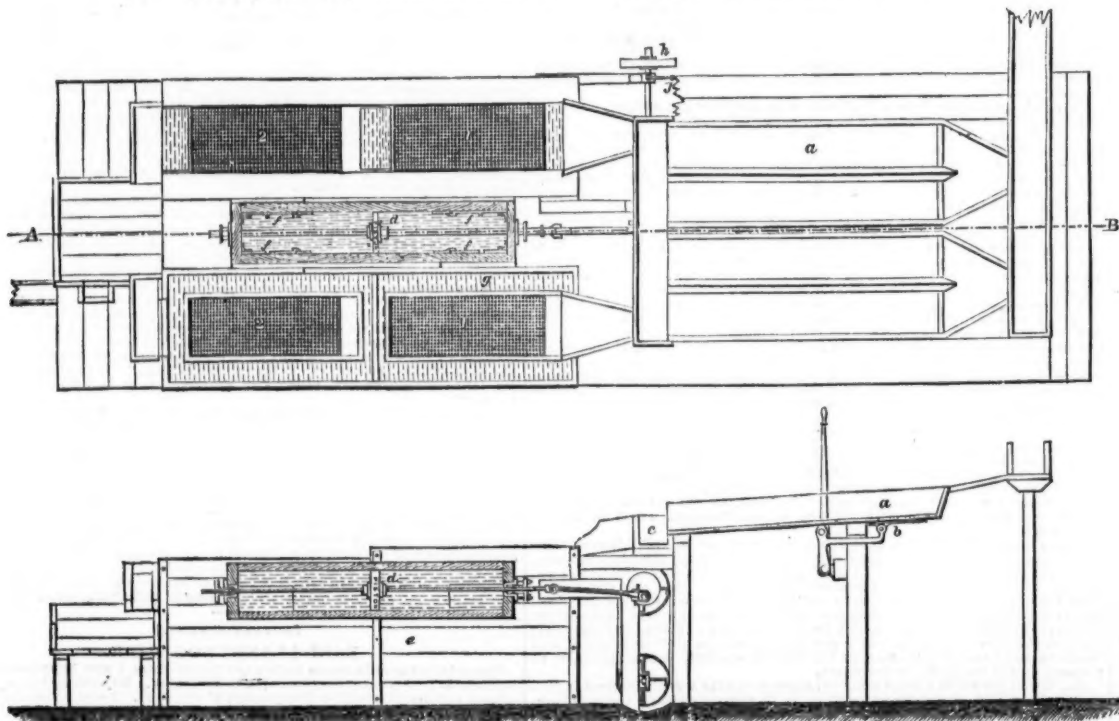
The arrangement of the pump is founded on the principles of hydrodynamics, which mainly relate to the motion and rest of fluids; but this is not all, because, as air is naturally a compound with water, it becomes requisite also to notice the action of air under pressure and motion, and, therefore, the principles of hydrostatics have also in this case been remembered by the inventor.

According to a personal description by Mr. Burgh, we learnt that this arrangement of valves—as seen in the sectional views on the side opposite that of the boiler—is that the suction valves open top and bottom towards the plunger piston, and that the discharge valves open top and bottom from the same; also that those valves are relatively on the same level, being directly over and under the pump-barrel in all cases—and, therefore, in accordance with those principles alluded to, the air will at each stroke of the plunger pass out before the water. But while on this theme we may as well dwell a little on the action of pumps generally. Now, let it be presumed that a barrel has water in it—no matter how or when—and that the piston moves (say) upwards, and we can see the water. Mind well, that the air in the fluid will form bubbles, which rise to the surface, and there explode. So from that the air becomes the upper element for discharge; but, suppose the valves are so badly arranged that the air cannot escape first, as must be when the discharge valves are situated below or not on the same level as those for the suction, then the pump at the next

stroke will be surcharged with air, and thus the suction be reduced—for, be it remembered that, unless the supply is equal to the demand, a loss of delivery must result, and as air must, and will too, occupy space as well as solids, and the cubical contents of the pump and its passages remain the same, that space occupied by air will not permit, because it cannot, any water to fill its place, and thus at each stroke the suction is impaired—whereas if all the air were discharged with the water an equivalent supply must occur. That practical fact is what Mr. Burgh has based his pump upon, and we have pleasure in testifying that when we saw the pumps at work at his contractors, Messrs. Whieldon, Lecky, and Co.'s works, a short time since we were convinced of the correctness of his statements.

Our illustration represents a two-fold arrangement, because it is adapted for surface and deep working combined, as we mentioned at the beginning; and we now add, as a conclusion, that it is the only pump of the kind that so fully carries out those duties simultaneously.

## ORE-DRESSING MACHINERY.



ORE DRESSING MACHINERY—No. XVI.

**MOONTA JIGGER.**—At the Moonta Copper Mines, Yorke's Peninsula, South Australia, a double-acting piston-jigger is employed, shown in plan, Fig. 1, and in elevation, Fig. 2.

The arrangement consists of two close-covered hutches (*a*), a piston-box (*d*), and two pairs of strips (*e*). Each hutch is fitted with stationary sieves 1 and 2, having head boards for effecting the proper distribution of the stuff.

The stuff from the crusher trommel flows first into the strips, where the heavier particles collect together, and are occasionally withdrawn through the valve (*b*), whilst the lighter stuff passes to No. 1, and from thence to No. 2 sieve. The ore from the sieve sand falls through the meshwork of the sieve into the hutches, and is discharged as it may be found necessary through wooden doors, 27 x 22 in., which are opened for this purpose.

The waste sand from each set of jiggers is diverted to a common outlet cistern and launders, standing in front of the forward end of the piston-box. The piston, set horizontally, is driven from a disc fitted on the end of a shaft. The backward motion imparts an impulse to the stuff in No. 1 sieve; the forward movement effects a similar movement in No. 2 sieve. Each sieve compartment is brought into communication with the face of the piston (*d*) by the portways, *f*, to which are fitted regulating slide valves. The piston is formed of a piece of wood 14 in. x 14 in. x 3 in., which is fitted with a rod running in stuffing-boxes at the ends of the piston-box. The motion-pulley (*A*) is geared to the driving-pulley by means of a short leather strap. The total length of the apparatus is 23 ft.; its width, 9 ft.; the length from inlet launder to hutches, 13 ft.; length of hutches, 9 ft.; height of hutches, 4½ ft.; inside width of hutch, 3 ft. 3 in.; length of sieve bottoms, 4½ ft.; width, 22 in.; fall of sieves, ¼ in. per foot; distance between sieve frame and hutch, 6 in.; inside length of piston-box, 7 ft.; portways, 8 x 18 in.; width of strip, 14 in.; depth, 9 in.;

inclination, 1 in. per foot. The stuff jiggered varies from coarse bubble sand to 4 millimetres in diameter. The piston makes from 120 to 130 strokes per minute.

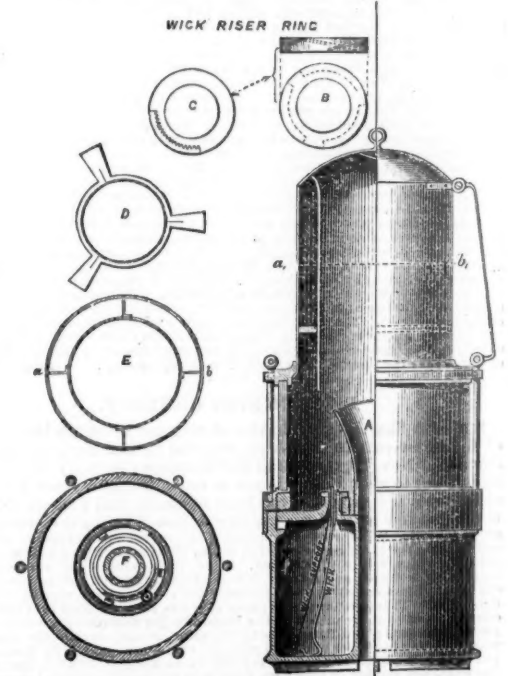
The sand is progressed across the sieves by the combined effect of the piston-stroke and the initial current of water. No separate volume of water is supplied to the hutches, as is common to the German machines. In the latter jiggers the area of the piston is usually the same as that of the sieve, but in the Moonta jigger the area of a pair of sieves is six times greater than that of the piston face.

In the German jigger one piston serves one sieve; at Moonta each face of the piston has to deal with two sieves. At Moonta the ore is readily enriched; in Germany much of the stuff contains a mixture of ore and a heavy waste, rendering an adjustment of stroke in each piston necessary. The Moonta jigger was devised by Mr. Painter, who with Capt. Hancock, the manager, has brought the apparatus into practical use.

2, Coleman-street-buildings, London.

**TREATING MANGANESE COMPOUNDS.**—The invention of Mr. THOS. ROWAN, of Glasgow, relates to the treatment of manganese sulphide and manganese carbonate, and to the application of the compounds thereby obtained, and of the manganese carbonate, as pigments and otherwise. The sulphide is heated in a vessel which is open, or admits access of air, and is thereby converted into a black oxide suitable for re-use in the manufacture of chlorine or otherwise, and also applicable as a black pigment. In carrying out this part of the invention it is of advantage to cause the material to pass down an inclined plate, or, what is better, down an inclined metal cylinder, which is strongly heated, and this improvement is even more advantageous when dealing with manganese carbonate. A uniform action is obtained by making the cylinder revolve continuously, whilst the action of the heat is regulated by adjusting the inclination. When making black oxide for re-use in the chlorine manufacture the apparatus is arranged so that the materials pass from the cylinder in which they are heated into a vessel of water provided with an agitator, whereby an homogeneous mud is formed, and the material thus rendered more suitable for re-use. Pigments of various shades are obtained by modifying the drying, heating, and coloring processes.

## IMPROVED MINERS' SAFETY-LAMP.



The improved lamp represented in the above diagrams has been designed by Mr. WILLIAM LINTERN, of Treforest, Pontypridd. It will be observed that the wick is to be circular, divided into three segments, and in the centre is to be a dome, covered with a leaf of platinum for a reflector, and to be perforated opposite the flame (the perforations are not shown in the diagram) with small holes for the partial support of combustion—the dome-head forming a cushion, against which an impulse of air may expend itself without endangering the extinguishment of the light. The remainder of the air-supply is taken in through perforated holes, just around above the glass.

The exit-holes are in four series, in as many chambers, between two solid cylinders, the products of combustion passing up the centre of the lamp to the top, where it turns down through proper openings into the four chambers, and so obtain exit through the holes shown in the elevation. The utility arising from this is considered to be that the lamp is completely protected from strong currents, which carry the flame through the ordinary lamps, since the chambers (exit) are separated, and in carrying the lamp forward against a current only one of the chambers would be presented towards the impinging air, and the impulse would not be felt in the other three, and the exit would proceed through these uninterrupted.

The platinum reflector is considered to be the best to avoid tarnishing. The part of the lamp covering the oil-reservoir is not screwed or fastened in any way, but rests on a ring of galvanised India-rubber, and is kept safely in its place and oil-tight by the lamp-top, when that part is screwed on. The object of this is to prevent the lamp being used without the top part—for if its use is attempted without the top there is nothing to ensure the oil being retained in its place, and a safety-lamp should only be used as a safety-lamp, with its top properly on, and secured. The mechanism for rising the triple wick is considered to be sufficient to do its work simply and efficiently, and to be free from complication. Thus, the



\* "The Coal Fields and Coal Trade of the Island of Cape Breton." By RICHARD BROWN, F.G.S., &c. London: Sampson Low, M. Low, and Searle, Fleet-street.



privileges which had been granted to them. In giving an account of the new collieries opened between 1858 (the date of the settlement above referred to) and 1870, Mr. Brown gives an abstract of the legislative Acts which have been passed, and which appear to be extremely liberal in their nature. His list comprises all mines that have been opened, whether still in operation or abandoned, and simple particulars are given as to the resources and prospects of each.

Throughout the book Mr. Brown has given a large amount of information as briefly as possible, and has supplied precisely those particulars most likely to be of value to his readers. For those engaged or about to engage in colliery operations in Cape Breton there is no work which could be consulted with greater advantage; for, whilst the facts are given in language readily to be understood by those not practically acquainted with coal mining, the utmost reliance may be placed upon the statements made, since they are based on the personal observation of the author.

#### FOREIGN MINING AND METALLURGY.

Orders for coal continue heavy in France, and means of transport remain insufficient. No improvement can be anticipated in the aspect of the eternal rolling-stock question until the spring, and the winter campaign through which industrialists will have to pass promises to be a hard one, as the severity of the season has been closing up the navigations, which have thus far been a precious resource. Meanwhile prices of coal are very firmly maintained, and an advance even appears imminent. In a report addressed to the Council-General of the Department of the Nord the local engineer-in-chief estimates that the Department consumes annually 3,200,000 tons of coal. The engineer expresses doubts that the line from Valenciennes to Auloy, impatiently awaited and slowly constructed, will prove insufficient, even in view of a line projected between Valenciennes and Maubeuge. The engineer also adds his quota of grumbling to the general complaints of commerce in reference to the inadequate supply of rolling-stock existing upon the various railways more or less connected with the Department.

The French iron trade continues to suffer in consequence of the great want of railway trucks and boats for the conveyance of the raw materials. A continually increasing number of industrial establishments are deprived of coke, coal, and iron minerals, and find themselves obliged to refuse numerous orders which reach them. Some works have, indeed, been partially stopped, to the great injury of employers and their numerous workpeople. In the Haute-Marne prices have been well sustained. Rolled iron from coke-made pig brought 84. 4s. to 84. 8s. per ton; ditto mixed pig, 84. 16s. to 91. per ton; ditto charcoal-made pig, 91. 12s. to 101. per ton. Plates have been quoted at 107. 16s. to 117. per ton; axes at 117. 4s. to 117. 8s. per ton; first-class sheets, coke-made, 91. 12s. to 91. 16s. per ton; ditto charcoal-made, 107. 16s. to 117. per ton. In the Department of the Cher the production of arms has been slackened. The Bourges foundry has reduced its number of working hours, and at St. Etienne and Châtelleraut the manufacture of Chassepots has also been curtailed "by order."

There has been very great firmness in the price of coal in Belgium. Some contracts have been concluded for rather long terms (three to six months), a circumstance which appears to indicate on the part of purchasers anticipations of an advance, and on the part of sellers some little want of foresight. In support of this assertion we may mention that a slight advance in prices has already occurred in the basin of the Couchant du Mons. The small industries of Belgium are very badly off for coal, and the requirements of domestic consumption have been so badly supplied that coal has been carted by ordinary wagons in some localities. At a time when many colliery proprietors contemplate a reduction in their extraction, in consequence of the impossibility of disposing of their production to the full extent, it seems strange that working miners should go on strike. Nevertheless, we learn that the miners in No. 3 Pit of the Monceau-Fontaine Company, at Monceau-sur-Sambre have struck for an advance of wages and a reduction of two hours per day in their period of labour. About 1500 working miners of the Belle-et-Bonne Collieries, at Jemmapes, have also suspended work, requiring an increase of wages. Coke, like coal, has been scarce in Belgium.

The iron trade maintains itself excellently in Belgium. Orders are everywhere abundant, and prices remain firm, with a general upward tendency. Many producers refuse to conclude long-term contracts at present rates, anticipating, as they do, in an early future a fresh upward movement. At an adjudication for 1000 tons of cast-steel Vignoles rails—cast either by the Bessemer or the Martin-Siemens process—with chairs, bolts, and fish-plates, the accepted tender was that of the Cockerill Company, at Seraing, at 137. 8s. per ton. The next lowest tenders were those of Mr. Jackson, of Paris (137. 9s. per ton), and Messrs. Adhemar, Le Roy, and Co. (147. 12s. per ton). A second lot of 1000 tons of similar steel rails was secured by Mr. Jackson, at 137. 9s. per ton; the next lowest tender was that of MM. Adhemar, Le Roy, and Co. (147. 12s. per ton). A lot of 50 tons of cramps was tendered for by M. Constant, at 117. 3s. 4d. per ton, and by M. Cambier, at 117. 4s. per ton. The market for old and second-hand rails remains animated. This industry, which was formerly unknown to rail manufacturers and merchants, has acquired of late a very considerable development in consequence of the extraordinary demand which prevails in America. The port of New York receives every week, in fact, considerable cargoes of old rails from England, the European continent, and even from the West Indies and South America. There is quite speculation, indeed, in the New World in old rails, which are conveyed, in consequence, at much expense across the Atlantic. Business in railway plant remains very active in Belgium, as in other parts of Europe. Contracts for locomotives and trucks follow each other with extraordinary rapidity, and they are, besides, of considerable importance. The great locomotive factory of Wöhlert, of Berlin, has just, it is stated, been transferred to a new company, for a sum of 2,400,000 thalers.

Copper has been somewhat firmer at Marseilles. Upon the German copper markets transactions have been particularly active, a circumstance which can scarcely excite surprise in view of the considerable requirements of industry and the important advance which has characterised the controlling markets. At Hamburg the article has displayed an upward tendency. At Rotterdam common Russian has been quoted at 51 fls., and Dronheim at 50 fls. to 52 fls. At Paris there have been numerous transactions in copper, and prices have been advancing. Upon the French tin markets prices are also advancing, and have approached 1607. per ton. In Germany also transactions in tin have displayed considerable animation, and prices have risen. In Holland 86 fls. has been paid for disposable Banca tin, while lots to be delivered at the spring sale are quoted at 86 1/2 fls. Billiton under sail has brought 85 1/2 fls. The French lead markets have presented no special features; French lead delivered at Paris is quoted at 191., and English and Spanish, delivered at Havre, at 187. 8s. per ton. The German lead markets have been quiet. At Hamburg and upon the Dutch markets lead has remained without change. There is little variation to report in zinc. At Paris business has been rather active; Silesian zinc, delivered at Havre, has brought 207. 16s. per ton, and other good marks 207. 12s. per ton.

**BATTLE MOUNTAIN, NEVADA.**—I visited a few of the most prominent mines in the vicinity of this place, the first of which was—  
The WHITE, owned by Knowles and Karl. We went down the shaft 148 feet, and then into one of the four drifts. There are 18 men employed. In the drift north of the shaft, 110 feet, the lode is almost perpendicular—dipping slightly to the east; and averages 1 foot in width. Upwards of 3000 tons of ore are said to be in sight, the first-class of which yields 30 per cent. lead and 275 per ton in silver; second-class about 25. The ore is sold to smelters in San Francisco, about 40 tons of first-class being shipped monthly. South of this lode, 1800 feet, is—

The SHILOH MINE, an extension of the same, and belonging to the same owners. The ore yields about 30 per cent. of lead, and \$100 per ton in silver. Three levels have been run from a shaft 104 ft deep, showing heavy bodies of ore. The hoisting works and pumping apparatus on this mine are very complete, and the whole property a very desirable one.

The AVALANCHE has a shaft 70 feet deep on a lode 2 1/2 feet thick. It is owned by Dunn and Brothers. The ore averages 30 per cent. in lead, and \$119 per ton in silver.

The AVALANCHE NORTH has a shaft 35 feet on a lead ore of which gives \$118 per ton in silver, and yields 40 per cent. of lead.

**NEVADA BUTTE COMPANY.**—The mill belonging to this company was built but a short time since, and has 15 stamps, weighing 750 lbs. each. The building is 70 by 90 feet. The engine was built at the well-known Vulcan Ironworks, in San Francisco; there are two large boilers. The coal used costs \$18.20 per ton, delivered at the mill. There are six pans and an equal number of settlers. Wm. Garrard is superintendent of the mill and mine.

The TRINITY belongs to this company, and is considered one of the best mines in this section. The shaft is 140 feet deep, and a drift run 100 feet south at a depth of 90 feet. The base metal ore yields largely, and many tons

have been shipped to your city for reduction. Another very promising mine belonging to this company is—

The BUTTE, and they are contemplating the erection of a large furnace for reducing the ore. The whole property is a valuable one.  
The BATTLE MOUNTAIN COMPANY have bought some copper mines, and have 24 men employed in working them. The main shaft is down 115 feet, a drift run about the same distance, and several shafts sunk from it, one 36 ft. deep. Ore has been taken out from chambers 4 by 30. The mine bids fair to be a very valuable one to the owners—an English company. The ore is shipped to England via San Francisco. The price for shipping is as follows:—From mine to railroad, \$7.50; from there to San Francisco, \$11; to Liverpool, from \$6 to \$7 per ton. The ore averages about 24 per cent. of copper. Mr. Jos. Richards is general manager.

**TRENTON MINE.**—This lode is located on the western slope of Battle Mountain. The main shaft is down 294 feet, one tunnel has been run in 3-0, and another 250 feet. The lode is about 12 inches wide. Wood and water are abundant. The ore averages 300 per ton. At Battle Mountain station I notice that some works have been erected for the reduction of antimony within the past year.—W. H. M.: *Scientific Press*, San Francisco.

#### LATEST FROM EASTERN NEVADA.

The EBERHARDT and AURORA MINE is shipping the usual quantity of ore by tramway and teams to the company's mills.

**SOUTH AURORA.**—Last week our report stated that the lower tunnel, for the purpose of cutting the mineral belt 70 feet below the old workings, had improved in appearance. The same spar body continues in the face of the tunnel. The Mitchell shaft, inside of the old works, is down 70 ft. A drift will be started from it to run south, connecting with the main tunnel mentioned above. After the connection is made, all the ore and waste will pass through it from the different works of the mine—avoiding the expense and inconvenience of hoisting. The Turner shaft is down 71 feet. A drift is running south-east to strike the Trewell shaft. When the different works now going ahead are completed the South Aurora Company will have one of the best opened mines in the State of Nevada.

**WARD BEECHER.**—The same force of men as reported last week is engaged breaking down ore and piling it back. There is also a large force of men working on a portion of the ground that was released at the final hearing of the junction case, on trial in the district Court some days ago. It is not considered necessary to hoist ore now, as there is already sufficient at the Manhattan Mill to keep the stamps going at present.

**EAST SHERBOGAN.**—The ore body has increased since last report in all the drifts, and in the East Exchange incline there is a stratum in the ore body, 2 feet thick, containing horn-silver in abundance. The Oxford shaft, started a few weeks ago north of the old opening, is not yet down to ledge matter. It is confidently expected the same streak found in the other workings further north will be cut when the required depth is reached. After the Oxford is down, other prospecting will be carried on north on the same line towards the point where it is proposed to commence the tunnel. As was stated once before in this review, the tunnel will tap the ore deep enough to give a large stop above. Drifts will be begun away with, and all the ore delivered on one dump. The drift to connect the Eberhardt and Aurora shafts is nearly through. Another drift will go ahead from the Exchange shaft to the Original tunnel. For a distance of 20 feet in the South Original tunnel the show of horn-silver (in the roof of the tunnel) is really astonishing, and there is hardly a spot over the whole surface that is not covered with it. There is a large increase of ore on the dumps since our last visit, and a much larger amount will be extracted daily when the necessary arrangements are made for winter—such as erecting an ore-house, and covering the shafts as a protection against snow and wind.  
—*White Pine News*.

#### HOW AN HONEST SILVER MINE WAS SOLD IN LONDON.

As a contrast to the manner in which some mines from the Pacific Slope have been placed on the London market, the following facts in relation to the sale in London of the Emma Silver Mine of Utah (which Prof. B. Silliman, of Yale College, states to be one of the great mines of the world), will be read with interest.

This mine was discovered in the early part of the year 1870, and is located at Little Cottonwood Canon, Utah, about 16 miles from the branch of the Pacific Railroad. The mine is 1000 feet high, and the owners are entitled to an extension of 600 feet, for which a patent title will in due time be granted.

As there was some conflict among the claimants to the title, it was necessary for them to come to an agreement, so as to secure the issue of the United States Patent, which has since been obtained. This rendered a sale of some of the interests imperative, and as the ore had been very largely shipped to England, and the property was better known in London than in New York, the holders of the controlling portion of the mine determined to offer the Emma to English investors.

The following table of receipts from the mine showing a net yield (after payment of all expenses) of \$231,059 for four months, was compiled from the books, and exhibited the extraordinary fact that the cost of extracting the ore ready for shipment had hitherto been under 15s. sterling per ton, or only about 2 per cent. of its value, in writing of which Prof. W. P. Blake says:—"The wonderful extent of this mass of ore, the rapidity and ease with which it is extracted, and its high value, make this mine unique in the history of mining in the United States, while it compares with the most brilliant and magnificent development in the silver regions of Mexico and South America."

#### ORE RAISED BY ORIGINAL OWNERS.

Consignments were made by them to the well-known firms of Messrs. Lewis and Son, of Liverpool, and Messrs. Bath and Son, of London, in about equal proportions. The first sale of ore by Messrs. Lewis and Son was on Oct. 27, 1870, and the first sale by Messrs. Bath and Son on Oct. 29, 1870.

#### AMOUNT REALISED.

Messrs. Lewis and Son sold from Oct. 27, 1870, to May 30, 1871, 120 1/2 tons, producing £78,884 19 11  
Messrs. Bath and Son sold from Oct. 29, 1870, to July 15, 1871, 220 1/2 tons, producing 84,770 8 3  
Total, 431 1 tons, producing £163,655 8 2  
This ore, consequently, realised an average of 37l. 19s. 4d. per ton.

#### ORE RAISED BY PRESENT VENDORS IN FOUR MONTHS.

The present vendors acquired the mine on April 25, 1871, and they have from May 1 to Sept. 1, 1871, raised and forwarded ore from the mine as follows:—  
To Messrs. Bath and Son, 164 tons of ore, estimated to realise... £ 62,794 0 0  
To the same firm, 188 tons of ore, estimated to realise... 61,92 0 0  
To Utah, and smelted there, 359 tons, which realised net... 10,052 0 0  
To railway station, now en route to England, for account of this company, 28-0 tons, of the estimated value of... 106,400 0 0  
On hand for smelting, for account of this company, second-class ore, 600 tons, net estimated proceeds... 60,000 0 0

Total... £298,438 0 0  
Deduct expenses:—  
Expenses at mine, from May 1 to September 1 (say)... £ 7,000 0 0  
Fright from mine to New York and to Liverpool, and other charges... 30,879 0 0  
Say, 8l. 15s. per ton, on 3529 tons, consigned to Liverpool and... 30,879 0 0  
Ditto at railway station, for account of this company, 2800 tons—say, at 8l. 15s. per ton... 24,500 0 0

Total... £262,379 0 0  
NET AMOUNT PRODUCED.  
Total estimated net yield of mine from May 1 to September 1, equal to four months' working... £231,059 0 0  
Or at the rate of nearly 70,000l. per annum.

With these facts before them, London capitalists at once took hold, and first-class boards of directors and trustees were formed, the latter consisting of George Anderson, M.P., Chairman; Major General Robert C. Schenck, United States Minister to Great Britain; and Colonel J. H. Puleston, of the firm of Jay Cooke, McCulloch, and Co., of London. The greatest care was taken in the prospecting, to supply the plain facts, and although the demands were for the present limited to 10 per cent. per annum, the whole amount of capital authorised to be raised was subscribed for in two hours after the opening of the books on November 10, and the stock was eagerly sought for at 5l. premium per share. The company intend still further to increase their profits by at once erecting smelting works on the spot, thus saving useless freight and charges on all refuse ore. Hitherto the ore has been shipped in sacks, paying unnecessary freight, on over some 50 0 miles, but so soon as the works are in operation, bullion alone will be shipped. Had this course been adopted at former shipments a saving of about 15 per cent. per annum, the whole amount of capital authorised to be raised would have been made, increasing the total net profit of the four months' working by the present vendors to 265,704l., or at the rate of nearly 800,000l. sterling per annum.

There is no mistake, that the company own one of the most valuable mines in the world, and it is unquestionably the best ever offered to English capitalists. It has been brought out in the only manner in which such schemes ought to be submitted to European investors, and its success will go far to counterbalance the outrageous speculations which have, during the present year, been thrust on unsuspecting purchasers.—*The Wall-street Journal*, New York, Nov. 25.

**MINING IN NEW SOUTH WALES.**—During the past month mining of all descriptions has gone on most satisfactorily, and good returns are keeping up beyond the average of last year. A matter which is well worthy of remark is that more general attention is being paid to mining matters than has been the case since the wild excitement of the gold discovery so entirely unhinged business, and sent our population almost en masse in search of gold. The advantage to the colony, in a business point of view, of a good payable gold field is now more universally acknowledged than it has ever been before, and a saving good ventures offer there is now no lack of capital to test them. Residents of Sydney have entered very liberally into schemes for testing the richness of our gold fields, more particularly those of Hill End and Tambora, and in a lesser degree that of Galgong and Knu Creek, and the result has been an unparalleled amount of activity on these fields. In copper mining there is also considerable activity. A company has been formed to work the Mount Mollison Mines, in the vicinity of Bungendore; and fresh discoveries of copper deposits have been made in the vicinity of Bathurst. With the opening of the railway line to the west and west of the town, as the mines at which they will be worked will to a great extent be connected with the Bowenfels coal field, thus giving opportunities for smelting at a cheap rate, which they do not now enjoy. Some of the tin ore from the Kilmore Mine, on the banks of the Macintyre river, and near Inverell, have lately been exhibited in Sydney. An assay has given a return of 60 per cent., and as an almost unlimited quantity of ore is procurable on the surface by mere washing or running through a sluice-box, there is every proba-

bility of a large quantity of the metal being brought to Sydney within a comparatively short period. The coal trade is just now very dull, many of the mines only working half time. The slackness is due to a temporary dulness in the demand for foreign shipment.—*Sydney Morning Herald*, Oct. 6.

**LARGE YIELD IN CALIFORNIA.**—Developments recently made at the Gwin Mine, Lower Rich Gulch, Calaveras, are unparalleled in the history of quartz operations in this State. A stratum of rock has been discovered in the main shaft, at the depth of 400 ft., that in richness eclipses anything of which we have ever heard. The rock closely resembles the slate of which the walls of the lead are composed. The stratum mentioned lies next to the footwall, and is about a foot in width and thickness. In colour and formation it so nearly resembles slate, that it requires a close examination to distinguish the two from each other. The inclination of the "streak" differs slightly from that of the shaft. Commencing at a point near the surface it crosses the latter diagonally, leaving the shaft at the 400 ft. level. By drifting a short distance on the lead, however, from the 500 ft. level, the stratum will undoubtedly be struck again. By the merest accident it was discovered that this singular deposit, instead of being slate, was simply a mass of sulphurets, carrying free gold in abundance; 2 1/2 ozs. yielded 166 grains of gold or at the rate of \$33,140 per ton! The rock was not selected. It was broken from a chunk at least 1 foot square, and is considered a fair test of the richness of the whole stratum.—*Scientific American*.

#### FOREIGN MINES.

**EBERHARDT and AURORA.**—The directors have received a further remittance of 36 bars, valued at \$200.

**BIRDSEY CREEK (Gold).**—J. A. Stone, Nov. 12: I have completed the old ditch, with the exception of a few days work at the head of the ditch. I have done everything in a firm and substantial manner, and I venture the assertion that there is not a ditch in California in better condition. I have not yet ascertained the whole cost, as I have not yet received the lumber bills; the cost will, however, exceed the \$10,000 sent for that purpose.—Moving Ditch. I should say cutting a new ditch on the other side of the ground purchased of W. H. Duryea. The fluming and ditching is completed, but I have been hindered on account of scarcity of iron for pipe to convey the water through the house, and cast-iron cut. I have the iron now, and shall be ready for water whenever it comes. The north and west tunnel is now in 10 ft., and the rock is considerably harder; they are, however, making good progress.

**ECLIPSE (Gold).**—Mr. H. Tregellas (Nov. 3): We stamped 100 tons quartz with our water-mill, and cleaned up only from under the stamps and copper plates, which yielded just \$2500. This rock came from the stamp above the 300 ft. level, where the lode had opened out in stopping to 9 feet wide. We did not clean up from the blanket washings, and only from two shaking-tables; I estimate this quartz will yield over \$30 per ton. We have resumed the sinking of Haymen's shaft below the 300 ft. level; lode 6 ft. wide, and I believe as valuable for gold as the stopes above the 300 ft. level, which has proved to be highly remunerative by our stamping. Six miners in these stopes can supply quartz enough for 15 stampers. We are also driving the 200 ft. level day and night, in which the lode is fully 6 ft. wide, and of the same character and value as in the stopes above. Our new mill works highly satisfactory, 30 stampers being erected. The turbine has power enough for 100 stampers, and works splendidly; nothing can go better, or give greater satisfaction.—In fact, from first starting up to this date we have had no cause to stop our machinery for repairs or adjustment. We have men to complete the building of workshops and dwellings for the employees, after which we shall extend the number of our stampers to 50, the whole ironwork and castings for which will be here on or before the 12th inst.; then I see no reason why we should not add another 50 stampers, as we can supply any number with quartz from the Eclipse Mine, at the north of the great cross-course, and if need be double it, from a supply to be obtained from the south of the cross-course.

Telegram, dated Nov. 16, from Mr. Henry Tregellas:—"Stamped, 130 tons; yield, \$2100. Remitted. Reliance teams cannot haul the quartz fast enough—remedy, tramroad."

**PACIFIC.**—Telegram from Capt. H. Prideaux, acting superintendent at Austin:—"Five bars forwarded, value \$500. Others follow soon."

**EMMA (Silver).**—The directors have received advices of the shipment of 400 tons of silver ore from Salt Lake, of the estimated value of 10,000l.

**SOUTH AURORA (Silver).**—The following are extracts from letters received by the directors from their manager:—"Hamilton, Nevada, Nov. 11: Through the company's bankers I ship this day seven bars bullion, No. 533 to No. 539, value \$461 90-100."—Nov. 16: "I have received 74 l. and Seligman and Co. have forwarded this day six bars of bullion, value \$525 74-100, being the last shipment of chloride flat ore crushed. We have treated 1320 3/4 tons of flat ore, and assayed, \$59 54-100; assay product, \$19,897 68 100; bullion product, \$17,948 68-100, or 90 1/2 per cent."

**IMPERIAL OTTOMAN.**—J. B. Champion, Nov. 23: The No. 3 lode, at No. 1 level, is at present worth about 15l. per ton for lead; it is composed of elvan, with branches of lead and blende throughout. The west part is gossan producing deposits of lead and carbonate of lead throughout. I have increased the number of hands driving and stopping to fourteen men. There is no material alteration in the cross-cut driving at the bottom level; the ground is composed of blue elvan, similar to the level above, but harder. The present level is within 3 fms. of the ore zone in the bottom of our shaft. The intersection of the lode, I should we meet with equal success. The intersection of the lode, I do not hesitate to say we shall be in a position to pay all working costs of the mine, and probably make a small profit besides. I have put three men to cross-cut Champion lode, but have nothing particular to remark. We have 16 persons dressing lead and blende, and have about 9 1/2 tons of lead cleaned—2 1/2 tons No. 2; and 7 tons, and a large quantity of blende, from No. 1, all of which I will forward to Touza as fast as carriers can be got to take it.

**CAPE (Copper).**—The directors have despatches per Syria to Oct. 28. The Spectacle and Kial Mine reports are received. The tributors at Koperberg have for the present been removed, as the yield there was not sufficient to maintain them, and a small party has been put to work on a promising centre on the company's property called Garap. No other mining alteration of importance has occurred.—Transport, Oct. 1 to 21: From Oukie to Port Noll 10th, 430 tons of ore and 54 tons regulus; to Hondehiep, 122 tons of ore. Bills of lading are received for 400 tons per Don Ricardo. The Hondehiep, chartered for a home cargo of about 400 tons, had arrived at Cape Town. The Lywood, to load about 350 tons, had arrived at Port Noll. The cargo, ex Groydon, about 511 tons, has been put forward for sale by public ticket on the 19th inst.

**PESTARENA UNITED (Gold).**—The directors have received the following telegram:—"418 ozs. of gold, from 728 tons of ore, for November."

[For remainder of Foreign Mines see to day's Journal.]

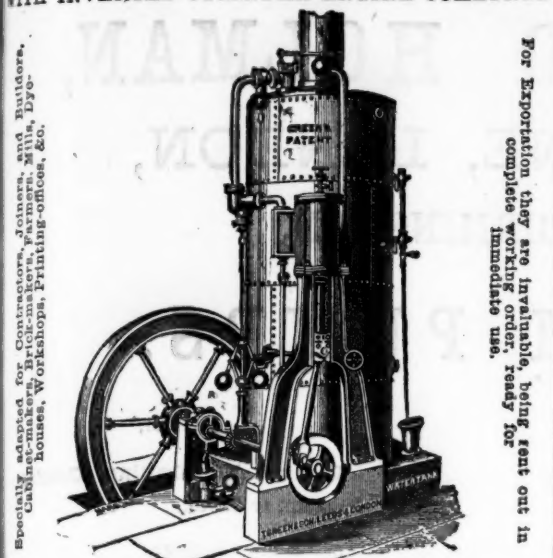
**COAL TRADE.**—Mr. J. R. Scott, the Registrar of the London Coal Market, has published the following statistics of imports and exports of coal into and from the port and district of London by sea, railway, and canal during November, 1871:—

By Sea.		By Railway and Canal.		
Ships.	Tons.		Tons cwt.	
Newcastle .....	231	150,814	London and North-Western .....	77,449 12
Seaham .....	13	4,297	Great Northern .....	92,757 0
Sunderland .....	95	57,891	Great Western .....	51,539 3
Middlesbrough .....	6	3,496	Midland .....	61,109 4
Hartlepool .....	88	29,348	East Eastern .....	2,926 5
Scotch .....	15	3,631	North-Western .....	1,000 0
Wells .....	2	450	Brighton and South Coast .....	2,000 0
Yorkshire .....	32	4,417	London, Chatham, & Dover .....	842 7
Small coal .....	1	88	South-Eastern .....	783 0
Cinders .....	8	230	Grand Junction Canal .....	783 0
Total .....	491	255,062	Total .....	432,425 11
Imports in Nov., 1870 .....	585	282,266	Imports in Nov., 1870 .....	552,236 12
Comparative Statement, 1870 and 1871.				
By Sea.		By Railway and Canal.		
Ships.	Tons.		Tons cwt.	
Jan. 1 to Nov. 30, 1870 .....	2,690,358	Jan. 1 to Nov. 30, 1871 .....	4,049,907 11	
Jan. 1 to Nov. 30, 1871 .....	5,182,545	Jan. 1 to Nov. 30, 1870 .....	3,421,665 11	
Decrease in pres. year .....	692	214,873	Increase in present year .....	628,241 16

**CHEMICALS AND MINERALS.**—Messrs. J. Berger Spence and Co., Manchester, Dec. 6.—The past week has shown a steady business in chemicals, with but little variation in prices. Exports have slightly increased, chiefly in the States. An accumulation of stocks at New York causes quite an increase over last year's total shipments of this year will show a considerable increase of value. The home trade, just now, is remarkably steady. The full employment of paper makers gives almost unprecedented life to particular branches. Caustic soda is firm, and prices are freely paid for early delivery. Soda ash, unchanged; many forward contracts have been made. Bleaching powder, quiet. Soda crystals improved. Sulphate of ammonia, scarce; very few lots to be had for a price. Delivery; sellers caring rather to hold till the spring, as they expect considerable higher prices. Bichrome still 10d. Benzole enjoys a degree of animation. Nitrate of soda quiet, and holders disposed to take less than current quotations. **MINERALS.**—The paramount importance of the branch of trade, and its continued prosperity and expansion, make it the most agreeable of things to mark its progress week by week. We are almost tempted to look out new signs to describe such constantly repeated facts. The common-place little words, "iron and coke," are really such comprehensive expressions that it is next to impossible to over estimate their value. They have an equivalent in iron and coke, simply powder, and hence their importance. The trade in iron and coke is, therefore, more and more would be sold if more were produced. In fact, a ton, and a further ton may be expected. Coke has already advanced 1s. 6d. a ton, and a further advance may induce coke northward from South Wales. Ironstone, the next in order of importance, has become almost sensational. The demand for it is so great that it cannot at present be supplied. The gaping furnaces swallow so much of it that new furnaces are about to be put in blast, and for red hematite to new developments of ironstone were never before so intense. A name indicative of there is a market ever ready for ironstone. Bilbao, in Spain, a casual indication of good iron, is to be drawn upon for magnetic and other ores. Casualties at sea immediately demand for such ores is far greater than the supply. Bessemer steel is not a fact to be blotted out; 150,000 tons a year produce, effecting a saving of about half a million tons of coal, is a fact of such magnitude that for the whole world must know of it. Steel rails will be substituted for iron rails; the first fact of a Bessemer steel rail is that it is a fact which will wear out the faces of 22 iron rails, and save the coal that would be used in the production of that 22 iron rails, and save the coal that would be used in the production of that 22 iron rails. It is true that these facts are partially experimental; but they are evidently on the high road to a small revolution as to the exclusive use of iron. The opinion that Eastern England, with her hydrated iron ores, at present before long upon her at present formidable rivals. As the demand for iron is so great, the demand for Northamptonshire iron ore is so great that a firm at Wellington has orders on hand for 3000 to 10,000 tons weekly. Next in consideration must be non-metallic phosphates. These minerals have, and always will have, a real value. Antimony ores are finding their way here in large quantities.



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WITH INVERTED CYLINDER ENGINE COMBINED



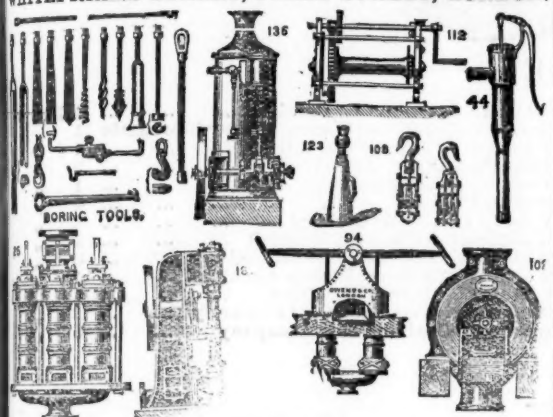
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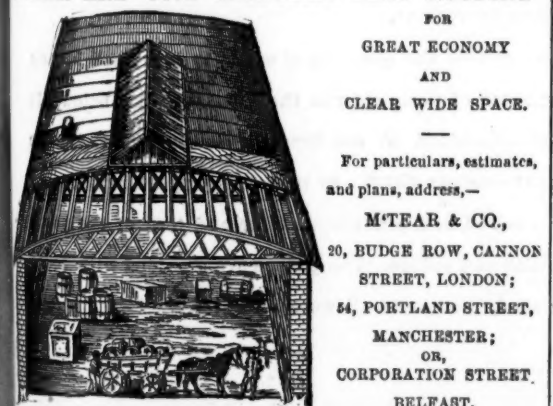
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The above drawing shows the construction of this cheap and handsome roof much used for covering factories, stores, sheds, farm buildings, &c., the materials of which are double bow and string girders of best pine timber, covered with 1/2 in. boards, supported on the girders by pulleys running longitudinally, the whole being covered with patent waterproof roofing felt. These roofs so combine lightness with strength that they can be constructed up to 10 ft. span without centre supports, thus not only affording a clear wide space, but effecting a great saving both in the cost of roof and uprights.

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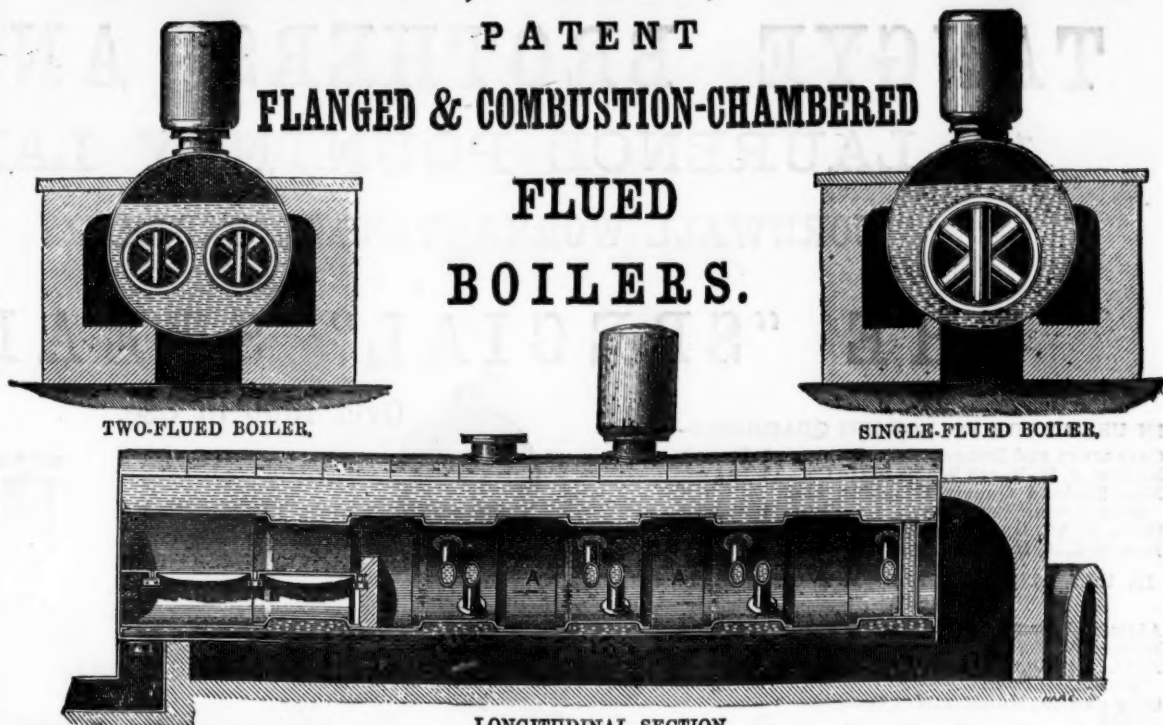
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ROYAL EXCHANGE, MIDDLEBOROUGH.

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The smaller rings being flanged, as shown in drawing, are thereby considerably strengthened, besides securing the most material point—a perfect EXPANSION-JOINT.

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ESTABLISHED 1825.  
Manufacturers of all kinds of Pumping and other Machinery.  
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BY APPOINTMENT TO HER MOST GRACIOUS MAJESTY THE QUEEN.  
FEARFUL

**BOILER EXPLOSIONS AVOIDED BY USING PAYNE'S ANTI-CORROSIVE FLUID.**

It is highly recommended by Engineers to Proprietors of Steam Boilers (Marine or Stationary) for PREVENTION and REMOVAL of INCORUSTATION. The price is 6s. per gallon. One gill per horse power per week will remove any incrustation from old boilers, and keep new perfect.

[CERTIFICATE.]  
"19, Staunton-terrace, Blue Anchor-road, S.E., March 12, 1869.  
"DEAR SIR,—I have minutely examined your Anti-Corrosive Preparation, and can state with confidence that in no way is it injurious to iron or brass. It is inodorous and perfectly harmless, even when swallowed.  
"Mr. Payne."  
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ORDERS ADDRESSED TO  
**PAYNE AND CO.,**  
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**WM. A. PAGE AND CO., MANUFACTURING PERFUMERS,**  
CRICKLEWOOD, MIDDLESEX.

FAMILIES SUPPLIED with FANCY and other SOAPS cheaper than the Co-operative Stores. These Soaps are manufactured under a Patent, and are considered the best and cheapest in the world. Sample boxes, containing a dozen lb. bars, at 8s. per box; household, containing 28 lbs. in each box, at 8s. 6d., 9s. 6d., and 10s. 6d. per box. Orders punctually attended to.

A GOOD DISINFECTING SOAP, highly recommended by the Medical Profession, at 6s. the box, containing one dozen lbs.



# TANGYE BROTHERS AND HOLMAN,

10, LAURENCE POUNTNEY LANE, LONDON,  
CORNWALL WORKS (TANGYE BROTHERS), BIRMINGHAM,

SOLE MAKERS OF

## THE "SPECIAL" STEAM PUMPS.

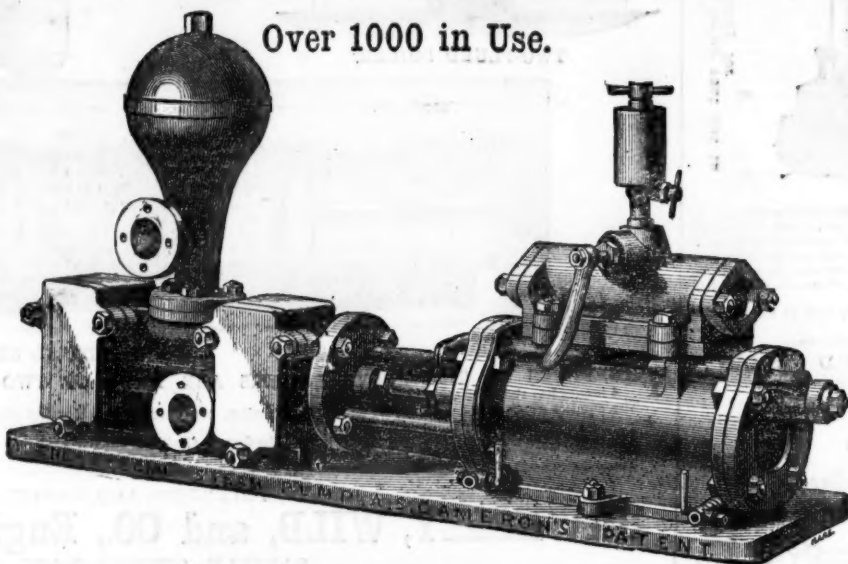
Over 1000 in Use.

### IN USE AT THE FOLLOWING QUARRIES:—

Carnarvon and Bangor Slate Co. ...	5 Pumps.
Kellow, J. E., North Wales Slate Co. ...	1 "
New Zealand Quartz Crushing and Gold Mining Company ...	1 "
Scott, R. W., Dungannon, Ireland ...	1 "
Foster, J. S., Hebburn Quarries ...	1 "

### IN USE AT THE FOLLOWING CHEMICAL WORKS:—

Alum and Ammonia Co., Bow Common ...	2 Pumps.
Barnes, W. C., Hackney Wick ...	2 "
Burt, Boulton, and Hayward, Tar Works, Millwall ...	1 "
Cory and Co., Manor-street, Old Kent-road ...	2 "
Whiffen, Thomas, Battersea ...	1 "
Jones, W., and Co., Middlesborough ...	4 "
Jarrow Chemical Co., South Shields ...	1 "
Richardson, J. G. and N. H., Jarrow-on-Tyne ...	1 "
Read, Holliday, & Sons, Huddersfield ...	2 "
Sheldon, Nixon, and Co., West Jarrow ...	1 "
Tennant, C., and Co., near Newcastle ...	7 "
Webb, H., & Co. (Manure), Worcester ...	1 "
Union Chemical Company, Stratford ...	1 "



### NOTE.

Requires NO Shafting, Gearing, Riggers, or Belts.

All Double-Acting.

Works at any Speed, and any Pressure of Steam.

Will Force to any Height.

Delivers a constant stream.

Can be placed any distance away from a Boiler.

Occupies little space.

Simple, Durable, Economical.

### IN USE AT THE FOLLOWING COLLIERIES:—

Adelaide Colliery, Bishop Auckland ...	3 Pumps.	North Bitchburn Colliery, Darlington ...	2 Pumps.	Stott, James, and Co., Burslem ...	1 Pump.
Acomb Colliery, Hexham ...	1 "	Newton Cap Colliery, Darlington ...	1 "	Seaton Delaval Coal Company, near Newcastle ...	1 "
Blackfell Colliery, Gateshead ...	1 "	Normanby Mines ...	1 "	Thornley Colliery, Ferryhill ...	1 "
Black Boy Colliery, Gateshead ...	1 "	Oakenshaw Colliery ...	1 "	Thompson, John, Gateshead ...	2 "
Castle Eden Colliery ...	2 "	Pease's West Colliery ...	2 "	Trimdon Grange Colliery ...	1 "
Crofton, J. Ct., near Ferryhill ...	1 "	Pease, J. and J. W., near Crook ...	5 "	Tudhoe Colliery ...	4 "
Carr, W. O., Newcastle ...	4 "	Pease, J. and J., Brandon Colliery ...	1 "	Vobster and Mells Colliery ...	2 "
Etherley Colliery ...	1 "	Pegwood Colliery, near Morpeth ...	2 "	Widdrington Colliery, Morpeth ...	2 "
Gidlow, T., Wigan ...	3 "	Pelton Fell Colliery ...	1 "	Whitworth and Spennymoor Colliery ...	3 "
Haswell, Shotton, and Easington Coal Co. ...	2 "	Railey Fell Colliery, Darlington ...	1 "	Westerton Colliery, Bishop Auckland ...	1 "
Lochelly Iron and Coal Company ...	1 "	Right Hon. Earl Durham, Fence Houses ...	1 "	Wardley Colliery, Gateshead ...	1 "
Leather, J. T., near Leeds ...	2 "	Skelton Mines ...	1 "	Westminster Brymbo Coal Company ...	2 "
Lumley Colliery, Fence Houses ...	1 "	South Benwell Colliery ...	4 "	Weardale Coal and Iron Company ...	6 "
Monkwearmouth Colliery, Sunderland ...	1 "	St. Helens (Tindale) Colliery ...	1 "		

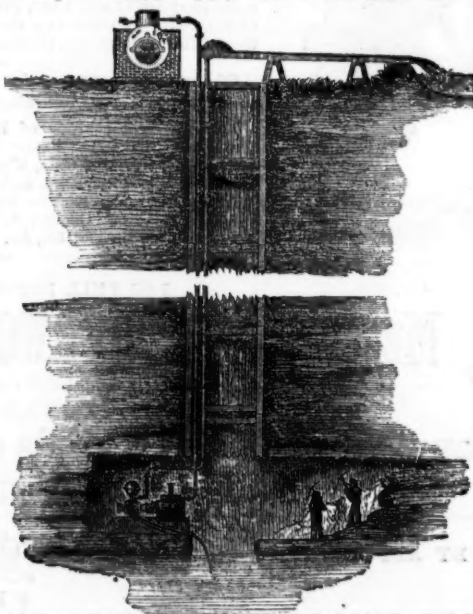
### IRONWORKS AND ROLLING MILLS:—

Bede Metal Company, Jarrow ...	11 Pumps.	Gilkes, Wilson, Pease, and Co., Middlesboro' ...	2 Pumps.	Whitwell and Co., Stockton ...	3 Pumps.
Bagnall, O. and T., Grosmont Ironworks ...	2 "	Lloyd and Co., Middlesborough ...	1 "	Whessoe Ironworks, Darlington ...	1 "
Consett Ironworks ...	2 "	Solway Hematite Iron Company, Maryport ...	1 "	West Cumberland Hematite Iron Company ...	1 "
Castleford Foundry Company, Normanton ...	1 "	Vaughan, Thomas, Middlesborough ...	2 "	Westbury Iron Company ...	1 "
Ellen Rolling Mills, Maryport ...	1 "	The Shotts Iron Company, Edinburgh ...	1 "		

### THE "SPECIAL" STEAM PUMP AS APPLIED FOR DRAINING MINES.

The arrangement in the accompanying illustration shows an economical method of draining mines without the expense of erecting surface-engines, fixing pump-rods, or other gearing. A boiler adjacent to the pit's mouth is all that is necessary on the surface; from thence steam may readily be taken down, by means of a felted steam-pipe, to connect the pump with the boiler. The pump may be placed in any situation that may be convenient for working it, and connecting the steam, suction, and delivery pipes.

These engines can be fixed and set to work in a



comparatively short time, and also at a very small outlay. They are used in large mines as auxiliary engines, and will be found invaluable adjuncts in all mining operations.

To estimate the quantity of water to be raised by any given size of pump refer to the tabulated list below. It is recommended to use long-stroke pumps where the height exceeds 100 ft., so that the largest result may be obtained with a minimum wear and tear of the pump pistons and valves. The pumps are provided with doors for ready access to all working parts.

### PRICES OF THE "SPECIAL" STEAM PUMPS.

Diameter of Steam Cylinder .....	2 1/2	3	4	4	6	6	6	7	7	7	8	8	8	8	10	10	12	12	14	16	26
Diameter of Water Cylinder .....	1 1/2	1 1/2	2	4	3	4	6	5	6	7	4	6	7	8	6	7	8	10	8	7	6 1/2
Length of Stroke .....	6	9	9	12	12	12	12	12	12	12	12	12	12	18	12	12	18	24	48	24	72
Strokes per minute .....	100	100	70	50	50	50	50	50	50	50	50	50	50	35	50	50	35	—	—	—	—
Gallons per hour .....	310	680	815	3250	1830	3250	7330	5070	7330	9750	3250	7330	9750	13,000	7330	9750	13,000	—	—	—	—
PRICE .....	£10	£15	£20	£35	£30	£40	£47 10	£50	£52 10	£57 10	£50	£55	£65	£85	£70	£80	£100	—	—	—	—

IF BRASS LINED, OR SOLID BRASS OR GUN-METAL WATER CYLINDERS, WITH COPPER AIR-VESSLS, EXTRA, ACCORDING TO SIZE.

Any Combination can be made between the Steam and Water Cylinders, provided the Lengths of Stroke are the same, thus—8 in. Steam and 3 in. Water, or 10 in. Steam and 3 in. Water, adapted to height of lift and pressure of steam, and so on.

**TANGYE BROTHERS & HOLMAN, 10, Laurence Pountney-lane, London, E.C.**